

APPENDIX G DESIGN AND CONSTRUCTION PACKAGES

The Corps design team, or an A/E under contract, prepares the Design and Construction package which consists of the Design Analyses and the Contract Documents (plans and specifications). Contractor requirements regarding the preparation of documentation are incorporated into the specifications prepared from the appropriate CEGSSs.

This Appendix provides guidance for the type of information required, for preparation of a design and construction package for a thermal desorption remediation project. As discussed in the Introduction, it is not the intent of this document to provide a step-by-step procedure of this package, but rather to provide general guidance on the type of information that should be provided in this package. The documents used to prepare specifications fall into two categories: criteria (TM's, ER's, ETL's) and specifications (CEGS). Criteria documents (TM's, ER's and ETL's) are used to help prepare plans and specifications for the package and edited CEGSSs are used in the construction contract.

All activities previously conducted on a project culminate in the preparation of a design and construction package. Since thermal desorption specifications are generally performance based rather than design based, the amount of detail provided in the package is subject to the discretion of the design engineer managing the project. There may be portions of the project that are design based such as civil engineering components.

1. Design Analysis. The design analysis is prepared by the AE or Corps design team to document the design decisions. ER 1110-345-700 Design Analysis, establishes the requirements and procedures for preparation of design analyses for military construction projects. For the purposes of this document a design analysis is defined as an assembly of all functional and technical requirements, and all design provisions and calculations applicable to the project design.

The Design Analysis is produced concurrently with the project Specifications, and is complete prior to the contract being awarded. Therefore, the Design Analysis should include only generic thermal treatment unit specifications, such as; types of contaminants treated, range of feed rates, types of systems, and generic removal efficiencies of various contaminants will be used to conduct the evaluation.

Site specific selection criteria to be used in the design analysis of a thermal desorption treatment system include: pretreatment requirements of the soil, concentrations and types of contaminant(s) of concern in the soil, moisture content of the soil, heat value of the soil, USGS soil classification, origin/source of the contaminated soil, quantity (tonnage) of soil to be thermally treated, analytical tests confirming status of the soil as either hazardous or nonhazardous waste, treatment criteria for each parameter/contaminant of concern after thermal desorption remediation, disposal requirements for treated soil, and analytical methods required for each parameter (U.S. EPA, 1994). Also, the Design Analysis should include criteria such as thermal treatment unit and support equipment location, pretreatment equipment location, soil staging areas (treated and untreated), and availability of utilities.

2. Treatability Studies. In order to provide additional information to potential bidders, a Treatability Study, or pilot scale test, may be performed on the site soils. These studies incorporate various combinations of temperature, retention time and contaminant removal rates. Depending on the type of thermal desorption unit/process selected for non-fuel contaminated soils, a treatability study, consisting of pilot scale test burn of the soil material would be required to identify the exhaust gasses resulting from the thermal process.

Results from the treatability studies are used to establish system performance criteria to be met by the designated thermal contractor. Based on this information, modifications of an existing thermal desorption unit's system operating parameters can be optimized to meet the specified performance criteria. System performance criteria is included in the performance specification for the thermal treatment unit for any and all contractors to bid on.

3. Plans for Bidding and Construction. This section reviews drawing information needed for preparation of a design and construction package. For a thermal desorption remediation project, the following types of drawings are essential for bidding and construction:

- Title Sheet, and Index of drawings
- Vicinity Map and Location Plan,
- Site Plan showing existing ground elevations and contours,

- Site Plans showing locations of adjacent buildings, utility line locations, wetlands, and surface water bodies,
- Plans and Cross Sections showing extent of contamination, groundwater flow, direction and elevation,
- Plan indicating the location of thermal treatment system, soil stockpile storage, staging area for treated and untreated soils, pretreatment area (materials handling), office trailers, other necessary support equipment,
- Plan and Cross Sections showing the area and depths of excavation,
- Soil Stockpile Details,
- Plan and Cross Sections showing the site after remediation with final grading after backfill.
- Flow Diagram of the thermal treatment process including all pre/post treatment process steps and all pre/post sampling points

EM 1110-1-1807 (Standards Manual for U.S. Army Corps of Engineers Computer Aided Design and Drafting CADD Systems) provides standards and procedures for CADD uses and applications and ER 1110-345-710 (Drawings) details the requirements and procedures for preparation and approval of drawings for military construction projects.

In addition to the previously listed drawings required for preparation of a design and construction package, the analytical test methods used to illustrate compliance with: performance specifications for soil treatment, residuals from the thermal desorption treatment system, and air methods to demonstrate compliance with air emissions should also be identified. Table G-1 is a summary of typical methods used in sample analysis and the appropriate method required for the remediation project should be included in CEGS 01554 Sampling and Analysis Requirements.

TABLE G-1
Typical Methods
for Sampling and Analysis

Constituent	Analytical Method
Solids Methods to Demonstrate Compliance with Performance Specifications	
Total Petroleum Hydrocarbons	EPA 418.1
TCLP Extract Concentration	EPA 1311 (extraction), EPA 6010/7000 (metals), EPA of metals or organics 8240 (volatile), EPA 8270 (semi-volatile), EPA 8080/8150 (pesticides/herbicides)
Metals Concentration	EPA 3050 (acid digestion), EPA 6010 (metals) (As,Ba,Cd,Cr,Pb,Hg,Se,Ag)
PCB	EPA 8080
Moisture Content	ASTM D 2216
Soil Bulk Density	ASTM D 2937, or ASTM D 1556, or ASTM D 2922, or ASTM D 2167
USCS Soil Classification	ASTM D 2487
Air Methods to Demonstrate Compliance with Air Emissions Standards	
Stack emissions (continuous): CO,CO ₂ ,O ₂ ,Opacity,HC,NO _x ,SO _x	Continuous Emissions Monitors
Stack emissions (routine):	Multiple Metals Train by EPA Method 29
Arsenic (total)	EPA Method 7060/7060 SW 846
Lead (total)	3020/7421
Stack emissions (compliance):	Multiple Metals Train by EPA Method 29
Total Arsenic	7060/7060
Total Barium	3005/7080
Total Cadmium	3005/7130

TABLE G-1 (cont)
Typical Methods
for Sampling and Analysis

Constituent	Analytical Method
Total Chromium	3005/7190
Total Lead	3020/7421
Total Mercury	7470/7470
Total Selenium	7740/7740
Total Silver	7760/7760
Particulate	EPA Method 5
HCl	EPA Method 5 with Na ₂ CO ₃ impinger
Volatile	VOST/0030, SW846 5040
Base Neutral/Acid Extractable	EPA modified Method 5/0010 SW846 3540/8270 Impinger (water) catches to be retained for analysis
Pesticide	EPA modified Method 5/0010 SW846 3540/8080 Impinger (water) catches to be retained for analysis
Dioxin (2,3,7,8-TCDD)	EPA Modified Method 5/0010 SW846 3540/8280
Dioxins and Furans	EPA Method 23
Ambient Air/Quality Testing/TWA Monitoring:	
Benzene	NIOSH 1501
Toluene	NIOSH 1501
Xylenes	NIOSH 1501
Naphthalene	NIOSH 1501
Lead	NIOSH 1501
Arsenic	NIOSH 1501
Chlordane	NIOSH 1501

TABLE G-1 (cont)
Typical Methods
for Sampling and Analysis

Constituent	Analytical Method
Ambient Air, Compliance (EPA)	
Volatile	TO-14
Naphthalene	TO-13
Chlordane	TO-10
Dioxins	TO-9
Lead	40 CFR 50 Appendix G
Arsenic	40 CFR 50 Appendix G
Particulates	40 CFR 50 Appendix G

4. Specifications. Specifics regarding the preparation, processing and obtaining approval for specifications are set forth in ER 1110-345-720 Construction Specifications. A publication entitled Index to Standard Specifications for Civil Works Construction is issued quarterly as an aid in checking such references in the civil works guide specifications. Three indexes, Civil Works, Military, and Abridged Military are available for Guide Specifications. Depending on project requirements, these indexes could serve as an additional information source.

4.1 Corps of Engineers Guide Specifications and Criteria Documents. The project Specifications will be developed in accordance with, but not limited to, the following list of guide specifications (CEGS). A guide specification for thermal desorption with the CEGS number 02289 is currently (April 1996) under development.

- 01110 Safety, Health, and Emergency Response (HTRW/UST)
- 01440 Contractor Quality Control;
- 01450 Chemical Data Quality Control;
- 02210 Grading;
- 02288 Remediation of Contaminated Soils and Sludges by Incineration;
- 02445 Solidification/Stabilization of Contaminated Material.

USACE criteria documents which provide detail for thermal desorption remediation projects include, but not limited to, the following:

- TM 5-818-1 Soils and Geology Procedures for Foundation Design of Buildings and Other Structures (Except Hydraulic Structures)
- TM 5-818-4 Backfill for Subsurface Structures
- ER 1110-1-263 Chemical Data Quality Management for Hazardous Waste Remedial Activities
- ER 1110-345-700 Design Analysis

4.2 Specification Requirements. The submittals requirements of the specifications should require the contractor to provide technical information on the execution of the project including a summary of experience and the technical approach to completing the following plans. After award of contract, the contractor obtains necessary permits and completes the project. The following bulleted items are relevant to the operation of thermal treatment units and may be part of a Remedial Action Work Plan.

- To ensure that the selected contractor addresses all chemical quality control management details associated with the site, and that all technical data generated is accurate and representative, contractor submittals regarding chemical data quality should be produced in accordance with 01450 - Chemical Data Quality Control. Analysis programs may include, but are not limited to the following: soil sampling program, sampling and analysis of feed material, sampling and analysis of residuals from treatment system, sampling and analysis of thermal unit by products (e.g. scrubber water), sampling and analysis of exhaust gases, sampling and analysis of ambient air conditions at the perimeter of the site, sampling and analysis of all of all foundations or structures utilized in the remediation before disposal, and characterization of soils for restoration of the site.

As part of the SAP, the Contractor shall prepare a Field Sampling Plan and a Quality Assurance Project Plan in accordance with the USACE document EM 200-1-3 Requirements for the Preparation of Sampling and Analysis Plans. These two items shall provide a comprehensive sampling plan for all matrices sampled, identify the procedures to be used to obtain representative data. The plan should contain a

comprehensive sampling plan for all matrices sampled, identify the procedures to be used to obtain representative data. The plan should contain descriptions of sampling equipment, sample containers, sample size, sample preservation, sample shipment, and sample program organization. The QAPP shall also describe the Quality Management Organization which will define the organization, and the authority and responsibility of persons performing quality management activities.

- Site, Safety and Health Plan. (CEGS 01110 Safety, Health, and Emergency Response (HTRW/UST))
- Contractor Quality Control Plan (CQC Plan CEGS 01440 Contractor Quality Control). This is a contractor supplied document which organizes all measurement and testing phases of the remediation starting from the point the contractor receives authorization to proceed. The CQC Plan may be broken down into the following subsections: excavation, thermal desorption unit erection (if on-site), thermal treatment of contaminated soils, backfilling, site restoration, site closure, and quality control and quality assurance operations.

The CQC Plan must demonstrate an understanding of the site remediation project and summarize the contractors decision making processes that impact the eventual cleanup and closure of the site.

- Thermal Treatment Unit Operation. The Specifications shall include the conditions under which the thermal desorption unit shall operate, as determined in the Treatability Study or Demonstration Test. The contractor is required to operate the thermal desorption unit under conditions that are proven to meet performance standards. The plan is broken down into the following subsections: normal operation, system operating limits, waste feed cut-off system, normal start-up and shut-down procedures, emergency shut-down procedures, and system alarms. The Contractor shall also provide a Demonstration Test Plan which details the procedures for conducting the Demo Test, and the associated sampling requirements.
- Materials Handling Plan. The contractor shall identify and address issues concerning the handling procedures for the residuals from the thermal treatment unit which

include: treated and untreated soil, scrubber water, decon water, pretreatment process water, stabilization chemicals, and APC residuals.

4.3 Project Specifications. In addition the following specifications are also required:

- Concrete structure construction specifications (TTU pad, decon pad, pre-treatment pad),
- Desorption performance criteria (see Appendix E), analytical equipment, and process controls (see Appendix E),
- Closure (see Appendix H).

The civil related specifications such as the excavation, backfill, pavement and concrete structure construction are detailed in the Corps of Engineers Guide Specification (CEGS) series.

4.3.1 Support Systems and Utilities. Support systems required for thermal desorption remediation activity include: trailers for contractor personnel and equipment, parking space for contractor and site personnel, portable toilets, site security (if required), communications (telephones, computers, and fax machines), contingency area for additional storage of soil stockpiles, decontamination area and a hazardous materials storage area.

Utility requirements include telephone lines to the trailers, electrical connection for thermal desorption treatment process power requirements, heating, lights and computers, and water for decontamination and treatment purposes, and natural gas connections for thermal treatment fuel requirements.

4.3.2 Reporting Requirements. Detailed reporting requirements should be included in the appropriate project specifications described above. Reporting requirements during the construction activities should include, but not be limited to:

- Contractor Weekly Data Quality Control Report - This report should contain as a minimum, a discussion on the location of work, weather information, quality management inspections and results, problems identified during the work week and any corrective actions.
- Notification of Problem Report - This report should be written in the event a problem at the site occurs which results unexpected in deviation from the schedule. Types of problems include unexpected difficulties with

excavation and analytical laboratory conflicts. The report is intended to define the problem, present a corrective action plan, and identify impacts on the schedule. The report should be typically be written within 2 to 3 days of a significant incident.

- Health & Safety Incident Report - This report should be written in the event an OSHA reportable accident or incident occurs.
- Backfilling Reports - This report shall provide execution details of the systematic plan developed in the CQC Plan in which soils will be deemed safe for backfilling on site.
- Thermal Treatment Unit Bi-weekly Progress Reports - These reports should document the contractor's progress during all stages of thermal treatment operations (i.e. start-up, shakedown, and production burn). The contractor shall also submit monthly operating data reports documenting the operating data captured during the month of operation.
- Demonstration Test - These reports shall document the findings and analytical results of the demo test.